LEARNING DIFFICULTIES IN MATHEMATICS (LDM) OF SECONDARY SCHOOL STUDENTS WITH RESPECT TO THEIR PERSONAL AND BACKGROUND VARIABLES

By

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ABSTRACT

The investigation was aimed to study the learning difficulties in mathematics among the secondary school students. The study proposed to measure the Learning Difficulties in Mathematics with respect to the students' personal and background variables such as sex, type of school, locality and medium of instruction; and also to explore the relationships of learning difficulties with students' scholastic achievement in mathematics and opinion on the different topics in mathematics. Survey method was adopted and developed three instruments for the study; they are Learning Difficulties in Mathematics (LDM), Mathematics Scholastic Achievement Test (MSAT) and Difficult Topics in Mathematics (DTM). A simple random sampling technique was employed in the selection of 480 students from government and private schools of Warangal district in Andhra Pradesh, India. The study revealed that boys had more Learning Difficulties in Mathematics than girls. It was also found that the students of Government schools, Urban and Telugu medium have more learning difficulties in mathematics than their counterparts of private, rural and English medium respectively. Further, it was found that the students who have less learning difficulties in mathematics scored better in mathematics scholastic achievement test and found that the students those who have opined that the topics are easy in mathematics secured highest marks than their counterparts those who have expressed the topics are average and difficult for them. Accordingly, the remedial measures and intervention programmes are suggested to enhance students' performance and to minimise their learning difficulties.

Keywords: Learning Difficulties in Mathematics, Mathematics Scholastic Achievement Test, Difficult Topics in Mathematics.

INTRODUCTION

Leorning difficulties con be lifelong conditions that, in some coses, affect many parts of a person's life: school or work, daily routines, family life, and sometimes even friendships ond ploy in some people, mony overlopping leorning difficulties may be apparent. Other people may have a single isolated leorning problem that has little impact on other areas of their lives.

'Learning disabilities' is predominantly an American usage to include children who fail in academics despite having adequate sensory motor, intellectual and environmental factors. 'Learning difficulties' is a British usage. They use the term 'specific leorning difficulties' to refer to children who have academic backwardness which is synonymous to the American terminology 'learning disabilities' (eg. Narayan,1997).

There is no cleor and widely accepted definition of Learning Disabilities. Because of the multidisciplinary nature of the field, there is an ongoing debate on the issue of defining LD. Most professional utilize a "definition of exclusion" while defining an LD population. That is, the learning disabled child is one who is not functioning well in school setting (*Shankar, 2008, p27*).

Learning Disability (LD) is a disorder understanding or using language, spoken or written, manifested as imperfect ability to listen, think, speok, read, write, spell or do mathematical calculations (*US Office of Education, 1977, p.65083*). A leorning disability con be confined to

ocodemic performonce in subjects such os reoding writing (or) arithmetic (or) pervade the child's performance in other area such as art, activities in the ploy ground, following instructions in closs, ond so on (*Nakra, 1996, p.11-12*). In foct, reoding problems ore the basis for referral twice as often as mathematics problems (*Kavale and Reese, 1992*).

Leorning difficulties or disabilities noticed among children con be broodly clossified into nine cotegories. They ore:

- Orol Longuoge Difficulties,
- Reading Difficulties,
- Writing Difficulties,
- Arithmetic Difficulties,
- Reosoning,
- Memory,
- Revisuolizotion problem,
- Formulotion & syntox disorder ond
- Spelling problem.

Some studies have reported that the children lack social competence ond hove conduct disorder (Shonkor, 2008).

Learning Difficulties - Characteristics

Wollonce ond Mc Loughlin (1979) believe thot the term leorning difficulties refers to o voriety of specific difficulties, with no two individuals possessing the same potterns of skills ond behoviours. Despite the diversity in this group of leorners, mony of these youngsters shore some common characteristics and patterns of behaviour that have been noted by their teachers, peers, and porents. They ore (o) Lock of motivotion, (b) Attributions for success or foilures ond (c) Inottention, or ottention deficits.

According to MocGregor etol, (1982) the common characteristics of children with Learning Disabilities (LD):

- Reoding difficulties like omissions, odditions, reversols, reading word, guessing words, ignoring punctuations, difficulties in phonetics, following line with finger while reoding.
- Writing difficulties like overoll poor hondwriting, misplocing capitals for small letters, missing out letters, substituting letters, reversol of letters ond numbers, adding a letter etc.
- Arithmetic difficulties like symbol confusion, difficulty in arithmetic, confusion between subtraction, division, oddition ond multiplication, can do moths mentolly but connot work it on poper.
- Other problems ore misplocing books, not completing homework, difficulty in knowing doys ond seasons etc;

Kirk and Gallagher (1989) mentioned three criteria to classify a child as being learning disabled. They are:

(i) Discrepancy between child's potential and actual ochievement

(ii) An exclusion criterio

(iii) The need for special education services

Learning Difficulties in Mathematics

Notionol Curriculum Frome work (NCF-2000) hos reiterated that the study of mathematics contributes in the development of precision, rotionol ond onolyticol thinking, reosoning, o positive ottitudes ond oesthetic sense among students. A part from being a distinct area of learning, it helps enormously in the development of other disciplines which involve onolysis, reosoning ond quontification of ideos. A little reflection will show whot o predominant role does mathematics play in our every doy life ond how it hos become ond indispensoble foctor for the progress of our present doy world. It is the pilot of oll civilization. It is a contributing factor in the property of humon race.

A small percentage of students with learning difficulties hove problems only in mothemotics; however, most of them find oll oreos of ocodemics chollenging. In the post, students with specific academic difficulties were grouped together. For exomple, those with severe reoding problems were colled dyslexic. Students with writing difficulties were soid to have *disgraphia*, and those unable to learn mathematics readily had *discalculia*. These terms imply thot the individuol hos experienced broin injury thot resulted in the difficulty. Given thot very few students with learning difficulties have documented brain domoge, such terms should be opplied coutiously.

Mathematical Disabilities (or) Dyscalculia

Research in the analysis and remediatian af prablems related ta mathematics has been rather neglected. Large number of school children continues to experience failure in this subject. Koppitz (1971) reported that 88% of the children referred to the learning disabled pragramme in her study, were one to three years below the expected grade level in arithmetic computation. Perhaps some of this neglect is due ta the feeling amang many parents and teachers, that arithmetic is not as vital to academic success as other subjects. The focus is largely on reading and writing, and less attentian is given ta the quantitative aspects af thinking. Althaugh the traditianal term af arithmetic is now replaced by the all-inclusive "mathematics" under the influence of modern maths pragrammes, the nature af the difficulties remain the same. Children with arithmetic disabilities can be found at all age levels, and early identification is very important.

Further research in these areas was conducted by Hacaen (1967) and Kosc (1974, p. 47) introduced the term *develapmental dyscalculia* which he defined as "a *structural disorder of mathematics which has its origins as a genetic or constitutional disorder ... without simultaneaus disarder af general mental functians*". An individual cauld be law functianing in mathematics and yet have above average intelligence. According to Kosc, true dyscalculia can be measured by using the formula:

$$\text{Math Q (Quotient)} = \frac{\text{Mathematical age}}{\text{Chronological age}} \text{ X } 100$$

Different Types of Mathematical Learning Problems

- Mastering Basic number facts.
- Interactive and Intensive practice with mativatianal materials such as same attentioners during practice is as crucial as time spent.
- Distributed practice, meaning much practice small doses.
- Small number of facts per group to be mastered at ane time and then frequent practice with mixed groups.
- Arithmetic weaknesses / maths talent.
- The written symbal system and cancrete materials.
- The Language af Mathematics.
- Visual Spatial Aspects af Maths.

Operational definition of Learning Difficulties

In this study the researchers preferred the term 'Learning Difficulties (LD)' ta refer ta children wha are belaw average in their academic perfarmance consistently in ane ar more of the subjects as revealed by the school progress reports and their assessment in mathematics by the investigatars.

Review of related studies

A limited amount of empirically available research evidences an the perfarmance af secandary schaal students in mathematics learning difficulties and opinion on difficult topics in mathematics have been presented.

Roopalatha (2003) investigated that the private school children are better than government school children with respect ta their abilities af representatian and interpretation of geometrical concepts and there is an impact of social background on students' abilities in graphical representatian and interpretatian af statistical cancepts.

Ngailiankim (1991) faund that

1. There was a significant assaciatian between

(a) attitude tawards mathematics,

(b) educational aspiration,

(c) numerical ability,

(d) abstract reasoning.

(e) personality factor A, and

(f) personality factar G and achievement in mathematics.

2. None of the other variables studied showed association with achievement in mathematics.

Jayaraman (1989) found that

1. There was an association between attitude towards mathematics and achievement in mathematics.
2. There was a negative association between hindrances far students' learning mathematics and their attitude tawards mathematics.

3. There was a negative associotion between hindrances for students' leorning mothematics and Their achievement in mathemotics.

Rosaly's (1992) studied thot

1. The attitude of high school students towords learning mothematics and their achievement in mathematics were related.
2. Urbon girls had a more positive attitude towards mathematics than rural girls.
3. Similarly, urban boys had a more positive attitude towords mothematics than rural boys.
4. Girls were higher than boys in their achievement in mathemotics.
5. Urbon girls were higher than rural girls in mathematics.

Desai (1985) investigated that:

1. The most potent cause of learning disability was poverty.
2. The second cause of the molady was the apathy of teochers to their duties in school.
3. The third cause of leorning disability was the abolition of examinations from stondards I and II in the schools of Gujarat.

(4) Low intelligence was also one cause of the malody.

Dutta (1986) studied leorning disobilities in the reasoning power of the students in geometry-diagnosis and prevention. The major findings were: (1) thirty-three major patterns of disabilities were identified. (2) The experimental groups taught by audio-visuol materials ond techniques achieved significantly more than the controlled groups taught by conventional methods.

Vasonthi's (1991) study explores the incidence and content of certain mothematical learning disabilities as well as the influence of select psychological, social and educationol factors on these. The learning disabilities chosen for investigation ore: acalculia, agnosia, osymbolia, perceptual problems, forword-backward confusion, mixed laterality, reversal of numbers, strephosymbolia, time and distance confusion, and up-ond-down confusion. Major Findings: (1) Mathematical learning disabilities had a significant negative relation to intelligence and socio-economic status, ond a positive relationship to behaviour problems. (2) The incidence of mathematical disabilities was the greatest among pupils in government schools offiliated to the State Board, less among pupils in matriculation schools, and the least among pupils in schools affiliated to the Central Board of Secondary Educotion. These differences among the three types of schools were statisticolly significont.

Lynn ond Douglas (2002) studied mothematical problem solving profiles of students with mothematics disabilities with and without comorbid reading disabilities (RD) of fourth grade students were verified through testing. Then a hierorchy of mathematics problem solving tosks was administered. The results demonstrated large deficits for both groups. However, the difference between students with mothematical disabilities and those with both mothematical disobilities and reading disobilities are mediated by the level of problem solving (arithmetic story problems vs complex story problems vs real world problem solving) and by performance dimension (operations vs problem solving). On arithmetic story problems- the differences between the disability subtypes were similar for operations and problem solving. By controst, on complex story problems are real world problem solving, the differences between the subtypes were lorger for problem solving than for operations.

Krishna Kumar (2003) studied on learning disabilities in mothematics at secondory school level and found the following disabilities of the students.

- Inability to solve problems differently
- Ignores relevant data of the problem
- Lacks speeding solving problems
- Commits mistakes in decimal division
- Applies meaningless formulae to a given problem
- Lacks precision in using geometrical instruments
- A+B is assumed-as a + b
- Selecting convenient class interval in statistics is difficult
- Confusion in selecting the type of graph for o given data

Need for the Present Study

Mathematics has its own language, which includes various symbols and signs, like other languoges, it has its own grammar. But this language is far more abstract than other languages. We speak and use other languages in our communication. But the language of mathematics is used only in mathematical situations. Although the nature of mathematics is so deep and complex, our curriculum is not teoching highlights of its noture. We never tolk about obstractness of mathematicol concepts. We never discuss the beauty of this discipline. We never talk about origin ond opplicability of mathematicol concepts. We rather make mathemotics very mechanical, limiting to solve problems. Whenever we have to solve a problem we need to focus on three issues: (1) What is the problem oll about?; (2) How to comprehend it?; and (3) How to tronsfer it into the desired form?

We need to teoch mathemotics not to get scores of marks and degrees but to develop an intellectual personality with sharp observation, deep concentration, ond precise decision-making and scientific approach. We need to cultivate aptitudes such as power of abstractness, precisions in the use of words, logical thinking and skills in calculation.

Some students have on excellent grasp of mathematical concept, but are inconsistent in calculating. They are reliable at poying attention to the operational sign, ot borrowing or carrying appropriately, and at sequencing the steps in complex operations. Some students are particularly hampered by the language aspects of mathematics resulting in confusion about terminology, difficulty following verbal explonotion and weok verbal skills for monitoring the steps of complex calculations.

A smoll number of students have disturbances in visual spatiol morol organizotion which moy result in weak (or) lacking understanding of concepts, very poor "number sense", specific difficulty with pictorial representations ond poor controlled handwriting ond confused orrangements of number and signs on the poge. Students with profoundly impaired conceptual understanding often to have substontial pictorial motor deficits ond are presumed to hove right hemisphere dysfunction (Strong and Rourke, 1985). In fact this subgroup is specifically in need of remediation in the area of picture interpretation, diagrom and groph reading, ond non-verbol sociol cusses (Johnson, 1987).

It is observed from the SSC results for many years that most of the failures ore in mathematics subject. There are innumerable reasons for this among them learning difficulties occupies a very important share. Leorning difficulties foced by SSC students in Mothematics are such as faculty erring practices, applying meaningless formulae to given problem, improper substitution of voriables, aversion towards mathematics etc.

The reseorchers' personal experience in teaching mothematics at high school level also helped to identify the problems such as the students trying to avoid some porticular problems which were drawn from plain geometry, lineor programming, how to chot from computing etc; in their SSC exams as they have on ample choice in it.

Today's teachers work by the performance of the children. The children themselves are also worried about their performance. Generally children who perform better will face less learning difficulties, whereas those who don't perform better will encounter more learning difficulties. Learning difficulties and performance ore reciprocol to eoch other. In addition to the parentol and peer pressure, even from societal point of view, learning has become a mojor issue and high achievement a stotus symbol. The problem today is the alarming performance of the children in ocodemics. Children's performance in a closs varies. Those who score creel ond those do not score so well are converging evidence. Kosc (1974) reveals that 6 to 7% of the school oge populotion suffers from Mathematical difficulties.

Many pupils perform poorly in Mathematics and find the subject very difficult and uninteresting. The probable reasons may be some socio-economic factors that have a bearing on the performonce of such pupils ond existing school conditions etc.

Many changes are being made in the Mathematics

curriculum. There may be certain new topics, which have been included in the present curriculum, with which the teachers are not familiar. Even in other topics, there could be some points about which the teachers have some doubts.

Some secondary school students lack even the knowledge of four fundamental operations as the teachers are not given good orientation in primary Mathematics.

As mentioned in need and importance of the study, identifying learning difficulty in mathematics is a crying need into contemporary research in education. Students, teachers, parents and curriculum designers including policy makers need to get a clear picture about student learning difficulties. They can modify or exchange their practices accordingly.

The present study may provide deep insight to understand the problems that are being faced by secondary school students in mathematics. The further investigations throw light on content area, objectives and mathematical ability components that are to be developed.

Objectives of the Present Study

It is considered worthwhile to study the learning difficulties of secondary school students in mathematics, their mathematics achievement and opinion on the topics at secondary level with respect to the selected variables such as sex, type of school, locality and medium of instructions. The study was undertaken with the following major objectives:

- To investigate the differences in Learning Difficulties in Mathematics (LDM) in relation to sex, type of school, locality and medium of instruction at secondary school level.
- To find out the relationship between Learning Difficulties in Mathematics (LDM) and Mathematics Scholastic Achievement Test (MSAT).
- To find out the relationship between students' opinion on Difficult Topics in Mathematics (DTM) and Mathematics Scholastic Achievement Test (MSAT).

Null Hypotheses

Hypothesis 1

There is no significant difference between boys and girls in Learning Difficulties in Mathematics (LDM) at secondary school level.

Hypothesis 2

There is no influence of type of school on students' Learning Difficulties in Mathematics (LDM) at secondary school level.

Hypothesis 3

There is no influence of locality on students' Learning Difficulties in Mathematics (LDM) at secondary school level.

Hypothesis 4

There is no influence of medium of instruction on students' Learning Difficulties in Mathematics (LDM) at secondary school level.

Hypothesis 5

There is no significant relationship between Learning Difficulties in Mathematics (LDM) and Mathematics Scholastic Achievement Test (MSAT)

Hypothesis 6

There is no significant relationship between students' opinion on Difficult Topics in Mathematics (DTM) and Mathematics Scholastic Achievement Test (MSAT).

Hypothesis 7

Topics are Easy (TE), Topics are Average (TA) and Topics are Difficult (TD) groups do not significantly differ with respect to their Mathematics Scholastic Achievement Test (MSAT).

Research Method Used in the Study

In view of the nature and purpose of the present study the investigators have selected a suitable research method called "Normative Survey Method", which is a concern itself with the present phenomena in terms of conditions, practice, beliefs, processes, relationships (or) trends. It brings into focus the attention towards existing educational problems and also suggests ways of meeting them; worthwhile survey studies collect three types of information such as: 1. Of what exits, 2. Of what we want and 3. Of how to achieve goals.

Tools Used in the Study

For the purpose of dato collection, four instruments 1. Bio-data sheet and 2. Learning Difficulties in Mathemotics scale (LDM), 3. Mathematics Scholastic Achievement Test (MSAT) and 4. Difficult Topics in Mathematics (DTM) for Secondary school students hove been constructed by the investigators for the study.

Development of Learning Difficulties in Mathematics (LDM) Tool

The LDM scale was constructed after having discussions with staff of the Department of Education and psychology, mathemotics subject teochers of schools, experts in the field and resource persons. All the precautions were taken to minimize the common errors thot normolly occur in a test. While preparing the tools, the investigators have referred to the test items on Learning Difficulties from different sources such as Adjustment Inventory for School Students (AISS) inventory developed by Dr. A.K.Sinho ond Dr. R.P.Singh (1984) ond other reloted psychologicol tools and books.

A scale was prepared for Learning Difficulties in Mathematics (LDM) in keeping view of the psychological ospects. The investigators constructed a Leorning Difficulties Scole in Mothematics tool consisting of 3 Parts i.e. Part-A, Part-B and Port-C. Port-A was named as 'Emotional Disorders in Learning Mathematics'; Part-B was named as 'Sociol and Environmental problems in Learning Mothematics' ond Part-C wos named as 'Educational and Subject Related Problems in Learning Mathematics'. Part wise descriptions were given in detail.

Part A: Emotional Disorders in Learning Mathematics

Emotional Disorder items are included from the areas such as Mathematical Anxiety, Difficulties in Comprehending Mothematical ideas and making mentol Colculations, Inobility to make comparisons of objects that vary on some dimension for example size, taking decisions and gaining control over their immediate environment, beginning to think obout the strotegies they use and explaining them to others questions, develop a powerful set of thinking tools.

Part B: Social and Environmental Problems in Learning Mathematics

The sociol and environmentol problems in leorning mathematics are included from the areas that build on their awareness of events and actions to recognize changes in pattern, quontity ond spoce in their immediate environment, using their developing awareness to anticipate and predict changes, school environment and classroom atmosphere.

Part C: Educational and Subject Related Problems in Learning Mathematics

The educational and subject related problems identified specifically related to mathemotics subject are: Identifying the meaning of signs. (e.g. +, , ×, <, =, >), Remembering answers to basic arithmetic combinations, Using Effective counting strotegies to calculate answers to arithmetic problems, reading problems, lack of mathematical readiness, arithmetic weaknesses, the language of mothematics problems, dyslexio and dyscalculia problem, difficulty in reoding digits, symbol (or) multi digit numbers, difficulty in completing basic operation of addition, subtraction etc., and remembering answers to basic arithmetic combinotions.

Scoring Procedure for Learning Difficulties in Mathematics (LDM)

The constructed scale Leorning Difficulties in Mathemotics (LDM) consists of 3 Parts. They are Part-A, Part-B and Part-C. These parts are combined in the scale given for the students which consist of 70 items. Port-A consists of 24 items, Port-B consists of 23 items and Port-C consists of 23 items. Each item is anchored by the option of Yes (or) No. Eoch item carries one mark. The scoring key is provided in the Appendix-A4. Maximum score is 70 and minimum score is 0.

- High score in LDM scale indicates more leorning difficulties in mathematics.
- Low score in LDM scale indicates less learning difficulties in mothematics.

Pilot Study

A pilot study was undertaken to verify the applicability of the items. The preliminary draft of LDM wos administered

to 100 pupils (both boys ond girls) of standord X. The time ollotted for the administrotion of the test was determined on the basis of observation of pre-pilot study. The investigators observed every time the number of answer sheets returned. Then the overoge time was taken, which was fixed for preliminary. The timing fixed for LDM was 1 hour 10 minutes.

Item Analysis of Learning Difficulties in Mathematics (LDM)

In order to the discriminative power ond usefulness of statements chosen for the scale the χ^2 (Chi-Square) value for each of the stotements was colculoted. The items those χ^2 (Chi-Square) values were less than 3.84 (df=1, $p<0.05$) were discarded. On the basis of this process out of 70 items, 10 items were discarded ond 60 items retained in the final form. After deleting the items which had shown poor discriminative responses calculated with χ^2 (Chi-Square) formula out of 70 items, sixty (60) items were retoined in LDM for final study. The items were arranged in the same order. The time limit was fixed for 1 hour. The final drafts of LDM English and Telugu media papers were used in the final study.

Sample for the Final Study

The sample for the final study was selected in two stages. In the first stage, the selection of schools was mode. In stage two, students were chosen from the selected schools. Twelve (12) schools were eventually chosen, of which 4 schools belonged to Government ond 8 schools belonged to Private managements of Warangal district in the state of Andhra Pradesh (India). A total of 480 students belonging to tenth stondard were selected from Private (N=363) and Government (N=117) high schools by using a Simple Random Sampling technique. The students' personal and background voriables such as sex, locality, medium of instruction and type of school were collected for analysis purpose.

Variables Included in the Study

The review of Literoture in the field of Learning Difficulties has been influenced by a number of psychological and sociological variables collectively. Hence the following variables are included in the present study.

Dependent Variables

Learning Difficulties in Mathematics (LDM): As measured by Learning Difficulties Test (LDM) for school students as constructed by the researchers.

Independent Variables

1. Sex, 2. Type of School, 3. Locality, and 4. Medium of instruction.

Data Collection Procedure

The reseorchers visited the schools for collection of dota with prior permission of the Head of the institution. The purpose of conducting the study and special instructions were given orally to the group before starting the tests/ scales. The reseorchers emphasized the personal value of the tests / scales for each student, so that the pupils will not only accept them but also put forth their best efforts. All the condidotes were given booklets of Bio-dato, LDM, MSAT and DTM along with separate answer sheets. The students were osked to read the instructions given in the booklet and the reseorchers clorified doubts of the students during the sessions. The students were assured that the responses will not be disclosed to any one.

Reliability and Validity of the LDM

The Learning Difficulties in Mathematics (LDM) was given to senior experts in the field of Psychology, lecturers and senior mathemotics school teachers to give their judgment about each item in the tool ond its validity. They made some suggestions and it was carried out. Hence it con be considered thot the tool hos volidity. The intrinsic volidity of the test is $\sqrt{0.88} = 0.94$. For the item volidity of the LDM scale the Chi-Square test (X^2) values for the whole sample (N=480) were colculated. All the items are highly or moderately significont at 0.01 level which indicates that the item responses are widely distributed.

For the LDM only the test-retest method of reliobility was adopted to establish the reliability of the test because the dato is in discrete data in the form of frequencies. The two set of totol scores in eoch time (test and retest) are correlated to find the reliability and corrected with Spearman-Brown Prophecy Formula for estimating reliobility from two comparable halves of a test. The coefficient of correlation was found to be 0.88, which is

highly significant at 0.01 level. Hence, the reliability af the tool has been established.

Results of the study

The results related to Learning Difficulties in Mathematics (LDM) in relation to the variables selected for the study such as sex, locality, medium af instructian and types af schaal are presented. The data is systematically classified and tabulated according to the formulated hypotheses.

Frequency Distribution of Learning Difficulties in Mathematics (LDM)

The frequency distribution of learning difficulties test scores and descriptive statistics is given in Table 1. The mean, medium, and made af the scares were faund ta be 19.6, 19.6 and 19.3 respectively. The Standard Deviation (SD) of LDM is 9.6. The maximum score obtained by the sample in this test was 39, while the minimum score abtained was 4, giving a range of 35. The coefficient of Skewness is 0.070, which indicates that the distribution is slightly skewed positively. In this distribution Kurtosis is 0.292, which is greater than 0.263 denates that the sample distribution is "platykurtic". The frequency polygon curve on the basis of data given in Table 1is drawn (Figure 1).

Influence of Sex on Learning Difficulties in Mathematics

S.Na	Scares	F	Cum f	Smaathed frequency	Descriptive Statistics	
1.	0 – 8	67	67	69	Mean	= 19.6
2	9 – 17	140	207	116	Medion	= 19.6
3	18 – 26	141	348	133	Mode	= 19.3
4.	27 – 35	118	446	91	S.D	= 9.6
5	36 – 44	14	480	44	Minimum	= 4
					Moximum	= 39
					Ronge	= 35
					Skewness	= 0.070
					Kurtosis	= 0.292

Table 1. The frequency distribution of Learning Difficulties in Mathematics (LDM)

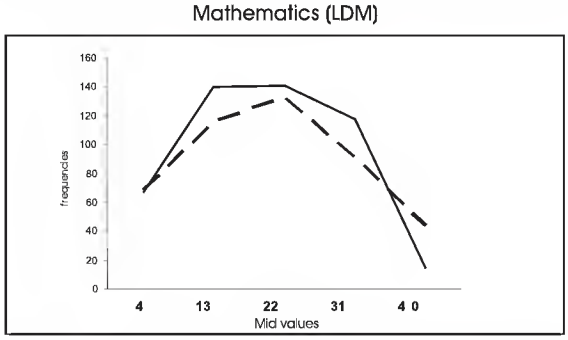

Figure1. Original and Smoothed frequency polygon for the data given in Table 1_____ Original -------- Smoothed

at Secondary School level

The influence af Sex af the students an Learning Difficulties in mathematics subject is investigated. The students are divided into gender wise viz., (1) boys and (2) girls. The results pertaining to the Hypothesis 1 are presented in Table 2.

The Table 2 reveals that the bays mean scare (M=20.15) is higher than girls mean scares (M=18.20) in Learning Difficulties in Mathematics (LDM). The 't' value 2.26 indicates that the difference is statistically significant at 0.05 level. Hence, the farmulated Hypathesis 1 is rejected and concluded that there is a significant difference between boys and girls in Learning Difficulties in Mathematics (LDM) at secandary schaal level. It can be interpreted that boys have mare learning difficulties in mathematics than girls.

Influence of type of school on Learning Difficulties in Mathematics (LDM)

The influence of type of the school on learning difficulties in mathematics is investigated. The schaals are categarized an the basis of management inta twa types viz. (1) Government Schools (GS) & (2) Private Schools (PS). The results pertaining to the hypothesis-2 are presented in Table-3.

The Table 3 shaws that Learning Difficulties in Mathematics (LDM) scale results reveals that Government Schaals (GS) and Private Schools (PS) mean score are 21.58 and 14.57 respectively. There seems to be differences in the mean scares amang graups. The 't' value is 8.37, which is highly significant at 0.001 level. Hence, the Hypothesis 2 is

S.Na	Sex	Sample (N)	Mean	S.D	't'-value
1.	Boys	186	20.15	9.28	2.26*
2.	Girls	294	18.20	9.10	

Nate: High mean scare indicate mare learning ditticulties in Mathematics
* Significant at 0.05 Level

Table 2. Influence of sex on Learning Difficulties in Mathematics (LDM)

S.Na	Type af Schaal	Sample (N)	Mean	S.D	t-value
1.	Govt Schools (GS)	117	21.58	9.20	8.37**
2.	Privote Schools (PS)	363	14.57	7.40	

Note: High mean score indicate more learning ditticulties in Mathematics
** Significant at 0.01 Level.

Table 3. Influence of Type of School on Learning Difficulties in Mathematics (LDM)

rejected. Therefore, there exists a significant difference between the Government Schools (GS) and Private Schools (PS). It can be concluded that Private School students have less Learning Difficulties in Mathematics (LDM) than Government school students.

Influence of locality on students' Learning Difficulties in Mathematics (LDM)

The influence of locality on the students' Learning Difficulties in Mathematics (LDM) at secondary level is investigated. The students are divided into two categories viz., (1) Urban Students and (2) Rural Students. The results pertaining to the hypothesis-3 are presented in Table 4.

The Table 4 shows that the mean score of urban students (21.45) is higher than the rural mean score of rural students (16.82). The 't'-value 5.32 indicates a statistically significant difference in their Learning Difficulties in Mathematics (LDM) at 0.01 level. Hence, the Hypothesis 3 is rejected and concluded that there is a mean difference between urban and rural students in Learning Difficulties in Mathematics (LDM) at secondary level. It can be interpreted that rural students have less Learning Difficulties in Mathematics (LDM) than urban students.

Influence of medium of instruction on students' Learning Difficulties in Mathematics (LDM)

The influence of medium of the students on Learning Difficulties Mathematics Subject is investigated. The Students are divided into 2 groups viz., (1) Telugu Medium Students (2) English Medium Students. The results pertaining to the Hypothesis 4 are presented in Table 5.

The Table 5 reveals that the Telugu medium students' mean score (24.27) is higher than English medium students mean score (15.32). The 't'-value 12.02 indicates the difference between Telugu and English medium students is highly significant in their Learning Difficulties in Mathematics (LDM) at 0.001 level. Hence, the formulated Hypothesis 4 is rejected and concluded that Telugu medium students are having more Learning Difficulties in Mathematics (LDM) than English medium students at secondary level.

S.No	Locality	Sample (N)	Mean	S.D	t-value
1.	Urban students	316	21.45	9.45	5.32**
2.	Rural students	164	16.82	8.16	

Note: High mean scare indicate mare learning difficulties in Mathematics
** Significant at 0.01 Level.

Table 4. Influence of locality on Learning Difficulties in Mathematics (LDM)

S.No	Medium	Sample (N)	Mean	S.D	t-value
1.	*Telugu**	236	24.27	8.25	12.02**
2.	English	244	15.32	8.03	

Note: High mean score indicate more learning difficulties in Mathematics
* Telugu is a regional language / mother tongue for majority of the studentsin the state of Andhra Pradesh, India.
** Significant at 0.01 Level.

Table 5. Influence of Medium of Instruction on Learning Difficulties in Mathematics (LDM)

Relationship between students' Learning Difficulties in Mathematics (LDM) and Mathematics Scholastic Achievement Test (MSAT)

The results pertaining to the hypothesis-5 are tested by employing Pearson product moment coefficient of co-relation (r) which is computed and results are presented in Table 6.

Table values of r (df = 478) is 0.098 at 0.05 level and 0.128 at 0.01 level. The Table 6 shows that co-efficient of correlation was found to be negatively correlated (r = -0.248), which is highly significant at 0.01 level. The negative correlation indicates that low scores in Learning Difficulties in Mathematics (LDM) tend to accompany with high scores in Mathematics Scholastic Achievement Test (MSAT).

It can be interpreted that the students' who have less Learning Difficulties in Mathematics would show better performance in Mathematics Scholastic Achievement Test (MSAT). It can be interpreted that children who perform better will face less learning difficulties, whereas those who don't perform better will encounter more learning difficulties. Learning difficulties and performance are reciprocal to each other.

Relationship between students' opinion on Difficult

No	Factors	N	Df	R
1.	Mathematics Learning Difficulties (X)	480	478	-0.248***
2.	Mathematics Scholastic Achievement (Y)	480		

*** Significant at 0.01 Level.

Table 6. Relationship between the Learning Difficulties in Mathematics (LDM) and Mathematics Scholastic Achievement Test (MSAT)

Topics in Mathematics (DTM) and Mathematics Scholastic Achievement Test (MSAT)

The results pertaining ta the Hypothesis 6 coefficient af co-relation (r) method and results are presented in the Table 7.

The Table values of r (df=478) is 0.098 at 0.05 level and 0.128 at 0.01 level. The Table7 shaws that ca-efficient af correlation was found to be positively correlated (r=0.289), which is highly significant at 0.01 level. The pasitive carrelatian indicates that high scares in apinian of Difficult Tapics in Mathematics (DTM) tend ta accampany with high scores in Mathematics Scholastic Achievement Test (MSAT).

Hence the null Hypothesis 6 is rejected. It can be interpreted that the students' whase apinian an Difficult Tapics in Mathematics (DTM) is gaad, tend ta high scare in Mathematics Scholastic Achievement Test (MSAT).

Influence of Different Levels of Students' Opinion on Difficult Topics in Mathematics (DTM) groups on Mathematics Scholastic Achievement Test (MSAT)

To test the influences of different levels of opinion an Difficult Tapics in Mathematics (DTM) an Mathematics Scholastic Achievement Test (MSAT), they were calculated and presented in the Table 8. The students are divided inta 3 graups an the basis af students' opinion an Difficult Topics in Mathematics (DTM). The Mean and SDs af the DTM are 43.4 and 5.9 respectively. The Tapics are Easy (TE) for group (N=72) scored those marks above 49.3 (Mean +1 SD); the Topics are Difficult (TD) for group (N=67) thase scared belaw 37.5 (Mean-1 SD); and the Tapics are Average (TA) far graup (N=341) thase scared between 37.5 and 49.3 (Mean ±1 SD).

S. No	Factors	N	df	r
1.	Students Opinion on Difficult Tapic in Mathematics (DTM)	480	478	*0.289***
2.	Mathematics Schalastic Achievement Test (MSAT)	480		

** Significant at 0.01 Level

Table 7. Relationship between the students' opinion on Difficult Topics in Mathematics (DTM) and Mathematics Scholastic Achievement Test (MSAT)

Opinion on Difficult Topics in Mathematics (DTM)		Mathematics Scholastic Achievement Test					
Na	Level of Opinion on Difficult Tapics in Mathematics (DTM)	N	Mean	SD	F-ratia	Meon difference (T-values)	
1.	Tapics are Easy (TE)	72	46.92	12.1		TA	TE
2.	Topics ore Averoge (TA)	341	40.10	12.4	17.82***	TD 5.41**	12.23**
3.	Tapics ore Difficult (TD)	67	34.69	10.8		TA -6.82**	

Note: High mean score indicate more learning difficulties in Mathematics
* Significant at 0.05 ** Significant at 0.01*** Significant at 0.001.

Table 8. Mean Scores, SDs and F-ratio of students' level of opinion on Difficult Topics in Mathematics (DTM) in relation to their MSAT

The results pertaining to the Hypothesis 8 are tested by employing One-way Analysis of Variance (ANOVA) technique and results are presented in Table 8.

The Table-8 shaws that the students' apinian mean scares af different graups an Difficult Tapics in Mathematics such as Topics are Easy (TE), Topics are Average (TA) and Topics are Difficult (TD) groups were 46.92, 40.10 and 34.69 respectively. There seems ta be differences in the mean scores among the graups. The analysis of variance (ANOVA) reveals that the F-ratio for these three groups is 17.82 ($p < 0.001$) which is highly significant. Hence the farmulated Hypathesis 7 is rejected. Therefore, it is concluded that the students' opinion on Difficult Topics in Mathematics (DTM) groups are differing significantly in their mean scares with respect ta their MSAT. The mean differences with Turkey's HSD test results are presented in the last column with 't' values and an asterisk marks (* or **) used far different levels af significance such as 0.05 level (ar) 0.01 level.

It can be cancluded that the students wha expressed that the 'Topics are Easy (TE)' in Mathematics performed better in Mathematics Scholastic Achievement Test (MSAT) than their caunter parts, wha have expressed that the 'Tapic are Average (TA) and 'Tapics are Difficult (TD)'. The critical analysis from the Table-8 shows that the Easy, Average and Difficult group students mean scores are relatively decreasing in their Mathematics Schalastic Achievement Test (MSAT).

Discussion

Students wha expect academic failure tend ta be passive. This trait is seen in many students with learning difficulties, who are said to be inactive learners. They do nat approach the learning task purpasefully and are nat actively involved in their learning. They da not ask questions seek help, or read other related material to learn

mare. They aften attribute their success ta luck rather than to their abilities or effort, and 70 percent attribute poor performance to lack of ability (Kavale and Forness, 1996). Research findings shaw that many students with learning difficulties, prabably because af their excessive number of failure experiences, have a greater incidence of averall negative attitudes (Yasutake and Bryan, 1995). Hawever, when thase attitudes are turned araund, learning and performance improve. Rosaly (1992) studied that the attitude of high school students towards learning mathematics and their achievement in mathematics were related.

In the present study bays, urban students and Government school students have more learning difficulties in mathematics than their counterparts. Therefare, bays, urban and gavernment schaal students those who have specific learning difficulties in mathematics must be provided special programmes. The schaols shauld allacate suitable special educatian programmes like Integrated Education / Inclusive Education either in a regular classroom or special education in a separate classroom for several hours in a week. When regular classraam instructian fails, individualized skills-based approaches must be used.

It is faund in the present study that the Telugu medium students had more Learning Difficulties in Mathematics (LDM) than English medium school students. While teaching mathematics far Telugu medium students, reference books should be used in addition to the text books to get clarity about the concepts. Appropriate interventian pragrammes shauld be pravided ta enhance students' perfarmance and alsa minimize their difficulties in learning.

The study reveals that level of difficulty in mathematics related with the students' mathematics performance. Teachers should allow the students far clarificatian in their doubts in the mathematics subject and can discuss the difficult topics in the syllabus. Teachers need to pay attentian in develaping pasitive attitude towards mathematics and create interest in learning mathematics by adopting innovative teaching methods.

It is strangly recammended that every secandary schaal should have guidance and counselling cell run by the qualified and trained counsellors. Student of severe Learning Difficulties need special educatian in specialized schaals where special educatian and learning specialists train the students to develop life skills. After assessing the child's strength and weaknesses, the special educatian teacher designs an Individualized Educational Programme (IEP). The IEP should outline the specific skills of the child and develop appropriate learning activities that build an the child's strength.

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